

NASA's current models to predict lift-off acoustics for launch vehicles are currently being updated using several numerical and empirical inputs. One empirical input comes from free-field acoustic data measured at three Space Shuttle Reusable Solid Rocket Motor (RSRM) static firings. The measurements were collected by a joint collaboration between NASA - Marshall Space Flight Center, Wyle Labs, and ATK Launch Systems. For the first time NASA measured large-thrust solid rocket motor plume acoustics for evaluation of both noise sources and acoustic radiation properties. Over sixty acoustic free-field measurements were taken over the three static firings to support evaluation of acoustic radiation near the rocket plume, far-field acoustic radiation patterns, plume acoustic power efficiencies, and apparent noise source locations within the plume. At approximately 67 m off nozzle centerline and 70 m downstream of the nozzle exit plan, the measured overall sound pressure level of the RSRM was 155 dB. Peak overall levels in the far field were over 140 dB at 300 m and 50-deg off of the RSRM thrust centerline. The successful collaboration has yielded valuable data that are being implemented into NASA's lift-off acoustic models, which will then be used to update predictions for Ares I and Ares V lift-off acoustic environments.



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